changes in the cerebrospinal fluid are affording the basis for the application of treatment at the more favorable periods, before contingent paralysis has appeared, which may often determine whether the treatment will be effective or not.

I must ask your indulgence for presenting a paper merely in outline. If the points presented impress you at times as being perhaps aphoristic, may I remind you that there exists competent, as I believe, clinical and experimental data for them all.

SOME PRACTICAL CONSIDERATIONS IN THE ADMINISTRATIVE CONTROL OF EPIDEMIC POLIOMYELITIS.[1]

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There are obvious practical limitations to the application of scientific laboratory and clinical knowledge in the public control of communicable disease. Furthermore, when the means of transmission, of immunization, and of detection of carriers of a disease are lacking the resources of the public health officer are sadly restricted. In view of the keen public and professional interest in the recent severe epidemic of poliomyelitis and the advantages which should accrue from a frank admission of the accepted facts, I venture to present the following statement of the situation as it must face professional advisers of public policies, so far as this particular disease is concerned.

The use of popular educational publicity will go far to teach parents the necessity of obtaining competent medical advice immediately upon the appearance of fever, pain, digestive disturbance, or acute symptoms of any kind in little children. Such advice is applicable at all times, but is listened to with respect only when the public is interested or is aroused to a particular danger. The benefit of following such advice is seen at once in the earlier home recognition of the common infections of childhood, a quicker appeal to the family physician, and in the more prompt and general reporting of communicable diseases of children to the health authorities. To the adoption of such advice we may attribute the decided reduction of the infectious diseases (pertussis, measles, diphtheria, scarlet fever, and infantile diarrhea) during the past summer.

The health officer can, with propriety, warn parents against allowing the indiscriminate association of children, and particularly against contact with children in whose families there are acute illnesses of any kind. As a type of simple, direct, practical advice the following extract from a circular of information to the public will serve for issue through the field force and the newspapers:

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[1] Read before the College of Physicians of Philadelphia, December 6, 1916.

INFORMATION FOR THE PUBLIC.*

"Infantile paralysis (poliomyelitis) is a catching disease. How it is spread is not yet definitely known. In most cases the disease is probably taken directly from a sick person, but it may be spread indirectly through a third person who has been taking care of the patient or through children who have been living in the same household.

The early symptoms are usually fever, weakness, fretfulness or irritability, and vomiting. There may or may not be acute pain at this time. Later there is pain in the neck, back, arms, or legs, with great weakness. If paralysis is to occur it usually appears from the second to the fifth day after the sickness begins. Many cases do not go on to paralysis.

The germ of the disease is present in discharges from the nose, throat, and bowels of those ill with infantile paralysis even in the cases that do not go on to paralysis. It may also be present in the nose and throat of healthy children from the same family. Do not let your children play with children who have just been sick or who have or recently have had colds, summer complaint, etc. For this reason children from a family in which there is a case of infantile paralysis are forbidden to leave their home. If you hear of their doing so report it at once to the Department of Health.

Persons over sixteen years of age, from families where there are cases of poliomyelitis, may continue at work unless their business has to do with the preparation or handling of food or drink for sale.

If you hear of a case in your neighborhood and the house is not placarded, notify the Department of Health.

How to Guard Against the Disease. In order to prevent the occurrence of this disease, parents should observe the following rules:

Keep your house or apartment absolutely clean.

Go over all woodwork daily with a damp cloth.

Sweep floors only after they have been sprinkled with sawdust, old tea leaves, or bits of newspaper which have been thoroughly dampened. Never allow dry sweeping.

Screen your windows against flies, and kill all flies in the house.

Do not allow garbage to accumulate, and keep pail closely covered.

Do not allow refuse of any kind to remain in your rooms.

Kill all forms of vermin, such as bed-bugs, roaches, and body lice.

Pay special attention to bodily cleanliness. Give the children a bath every day and see that all clothing which comes into contact with the skin is clean.

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* Extract from leaflet issued by the New York City Department of Health, July, 1916.

Keep your children by themselves as much as possible. Do not allow them to visit moving picture shows or other places where children may gather.

Children should not be kept in the house; they should be out-of-doors as much as possible, but not in active contact with other children of the neighborhood. Do not take them on a street car, unless absolutely necessary, or shopping.

Do not allow your children to be kissed.

It is perfectly safe to let your children go to the parks and playgrounds if only two or three of them play together; they should not play in large groups, and you should not let them come into contact with children from other parts of the city.

Remember that children need fresh air in the summertime, and outdoor life is one of the best ways to avoid disease.

If there is a public shower bath in a school in your vicinity, send the older children there every day for a shower bath. This is perfectly safe and will help keep them in good health.

Give your children plain, wholesome food, including plenty of milk and vegetables.

Keep the milk clean, covered, and cold. Do not allow the milk or any other food to be exposed where flies may alight upon it.

Wash well all food that is to be eaten raw.

In Case of Sickness. Remember that during the hot weather children are apt to have stomach and bowel troubles. If your child is taken sick with loose movements of the bowels, or with vomiting, do not at once fear that it must be infantile paralysis; it may be simply digestive disturbance. Give the child a tablespoonful of castor oil and plenty of cool water to drink, and *send for the doctor at once.*

If you cannot afford a doctor's services, telephone the Department of Health and one will be sent free of charge.

If a doctor or nurse from the Department of Health visits your home, give them all the information you can. They are sent to show you how to keep your children well.

Do not give your children patent medicines or buy charms of any kind to ward off the disease. *The best preventive is cleanliness and strict observance of the rules that have been given."*

And when the advice has been given, the most unexpected and extravagant applications of it may ensue. Many a family of children was housed for weeks, often in tight-shut rooms, even in July and August, the children's pale faces pressed against the window panes, mute evidence of their unreasonable imprisonment.

The mother whose neighbor's children across the tenement hallway are attacked with poliomyelitis, one of the four dying of the disease and another a permanent cripple, is not easily persuaded that the warning of the health officer in papers, circulars, and by the visit of the nurse does not logically demand home isolation of the well during the epidemic. When the visiting nurse is met by a door slammed in her face, where previously welcomed as the family's guardian and friend, we see how the laity reacts to the warning against contacts, the nurse being supposed to be constantly carrying disease from family to family. In the main, however, such educational propaganda is valuable but beyond this there is to my knowledge no warning or advice which can fairly be considered to produce any tangible results before or during an epidemic of poliomyelitis. There are sound reasons for advising the screening of living and eating premises against insects. There is always advantage in maintaining the person, the home, and the public highway in cleanly condition. Cooked food is safer than raw food for children in summer.

Up to the present moment there is no practical experience which can be claimed to show that environment, *i. e.*, housing, street dust, sewage, garbage, water, food supply, domestic or wild animals or insects, whether blood-sucking or not, has any relation to the origin or dissemination of poliomyelitis.

Aside, then, from the teaching of the principles of personal hygiene and avoidance of fatigue, the need of obtaining medical services in the presence of sickness and the probable advantage of avoiding contact between children during an epidemic, the hands of the health officer are tied by his ignorance of the means of transmission and the identity of carriers who do not show evidence of sickness.

When a case of sickness occurs the difficulties do not diminish. Diagnosis cannot be said to be either easily or positively made unless there is a paralysis present at some time. The increasing probability that there are as many non-paralytic as paralytic cases does not satisfy the parents of children, who naturally look for some positive proof, specific for the disease when it is diagnosed in a non-paralytic form, before willingly relinquishing their child to hospitalization or submitting to a quarantine.

We have no specific diagnostic test, though the spinal fluid considered in connection with a good history and definite clinical symptoms will, during an epidemic, even in the absence of paralysis, justify a positive diagnosis.

The discordant opinions of other physicians, whose services are commonly obtained by a resentful family when report of a case of poliomyelitis is made by the regular physician in attendance, bring the official diagnosticians of the Health Department into difficult relations with their fellow-practitioners, and not uncommonly result in feelings of resentment on the part of the family, which in one instance led to the institution of habeas corpus proceedings.

In a disease so little seen or recognized in the past in general practice it is not uncommon to lose that agreement and approval among physicians without which it is obviously impossible to obtain public compliance with restrictions or professional coöperation with health officers so necessary for early and universal notification.

In the early days of an epidemic inevitably the diagnosticians of the Department of Health see more cases in a very short time than do other physicians, and if thoroughly trained under capable supervision they rapidly become experts to a degree which temporarily at least makes them appear critical of their fellow practitioners.

This difficulty is readily met by organizing public medical clinics and lectures at various points throughout the city where pediatrists, neurologists, and Health Department diagnosticians may give personal instruction in the early and differential diagnosis of poliomyelitis.

The prompt issue of leaflets of information to physicians, early in the epidemic, will enlist their coöperation and give the essential facts in a form for ready reference. Such a circular as the following proved a helpful starting-point with many for a more thorough understanding of the disease with which, at least in its epidemic manifestations, few were at all familiar.

INFORMATION FOR PHYSICIANS.*

"*Early Diagnosis.* The attention of physicians is called to the necessity of an early diagnosis of all cases of poliomyelitis. Early recognition and strict quarantine are the chief weapons against the disease.

Reporting of Cases. All suspicious cases must be at once reported to the Department of Health by telephone, to be followed within twenty-four hours by a written report. The ability of the Department of Health to limit the spread of the infection depends upon the immediate reporting of every suspicious case.

Age of Persons Affected. It should be remembered that this disease may occur at all ages, although the great majority of the cases are found in children between the ages of one and five years.

Type of Disease. Peabody, Draper, and Dochez, of the Rockefeller Institute, give the following classification of the disease:

1. The non-paralytic or so-called abortive cases.
2. The cerebral group, with spastic paralysis.
3. The bulbospinal group.

Methods of Infection. The experiments of Landsteiner and Popper in Germany; Kling, Pettersson and Wernstedt in Sweden, and of Flexner and Noguchi in this country have proved that the disease is transmitted by the secretions of the nose and mouth and the bowel discharges of an infected person. The infection is transmitted through the mouth, tonsils, and nasal mucous membrane.

Contacts and Carriers. It must be remembered that while the transmission of the *disease* from a patient to other members of the same family is not usual, transmission of the *virus* is common.

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* Extract from a leaflet issued by the New York City Department of Health, July, 1916.

Experience warrants the assumption that in addition to direct contact the disease is spread by carriers, usually children, who are themselves immune but who harbor the infective material in their nasal or mouth secretions.

Symptoms. Early symptoms to be regarded as suspicious are: Fever, vomiting, slight diarrhea, listlessness, unusual fretfulness, and drowsiness. Later and more characteristic symptoms are: The appearance of weakness in any extremity, skin and muscular sensitiveness, spinal pain, especially on flexion, apparent or real rigidity of the neck muscles, Kernig's and MacEwen's signs.

Course and Duration of Disease. Paralysis appears usually before the sixth day of the illness; it may occur as early as the first day. Other symptoms, except spinal and muscular pain and rigidity and skin sensitiveness, rarely persist.

Non-paralytic or So-called Abortive Cases. Non-paralytic or so-called abortive cases are very frequent. In some epidemics they constitute from 25 to 50 per cent. of the diagnosed cases. The children have the early symptoms just mentioned, perhaps also the muscular tenderness and spinal pain. If carefully observed it may be noticed that they develop a paralysis of one or more groups of muscles, but that instead of the paralysis continuing it all disappears within a few hours. It is obvious that the recognition of such cases is of extreme importance in controlling the spread of the disease. The diagnosis of such cases is greatly facilitated by an examination of cerebrospinal fluid obtained through lumbar puncture.

General Care of Patient. Complete rest is of the utmost importance for either paralyzed or weak muscles for the first five or six weeks. Every effort must be taken to make this rest complete. The limb must not be allowed to drag on a paralyzed muscle. It should be supported by pillows or pads or bandages. There seems to be a greater tendency to atrophy if casts are used. A dropped foot may be supported by a sandbag or pillow; small rolls placed under the knee often hold the leg in a more comfortable position. The weight of the clothing should be kept off the legs by hoops or other device. If the head is somewhat retracted and the patient desires to lie on his back, he may sometimes be made more comfortable by a small pillow placed under the shoulders, allowing the head to fall back. The value of electricity for treatment in the first six weeks is very doubtful. In many instances it may do harm. Massage or passive movements should not be begun for at least five or six weeks and then should be used with great care. In cases that show a tendency to clear up rapidly the child should be kept in bed for some time after the ability to use the muscles returns. It should never be encouraged to try to stand or to use the muscles otherwise until a considerable time has passed.

Period of Incubation and Duration of Disease. The incubation period has been officially set at two weeks. Non-immune, infected persons usually manifest symptoms of the disease in from five to ten days after exposure. The average period of incubation is seven days. The early symptoms, noted above, usually last from one to seven days. Quarantine of the patient will be maintained for a period of at least eight weeks.

Prevention of Spread of Infection. 1. The children from an infected family will be confined to the house. (See "Quarantine.")

2. During the continuance of an epidemic of poliomyelitis children should not be allowed to congregate in public places.

3. Fresh-air outings or vacation camps are allowed, if kept under competent medical supervision, with an adequate physical examination of each child before enrolment and the exclusion of any child from an infected family.

4. Absolute cleanliness of all homes is essential; such cleanliness should include:

(*a*) Screens in all windows.

(*b*) Flies kept out of all rooms.

(*c*) Thorough cleanliness of all floors, woodwork, bedding, and clothing.

(*d*) Avoidance of dust (all sweeping should be done after the floors have been sprinkled with sawdust, bits of newspaper, or tea leaves, all thoroughly moistened).

(*e*) Garbage cans kept closely covered and washed out in hot soapsuds after they have been emptied.

(*f*) No refuse, either of food or other waste, allowed to accumulate.

5. Personal habits of cleanliness are essential; the hands should be washed before each meal, after each visit to the toilet, and before going to bed. Children should be warned about putting the fingers into the mouth or nostrils.

6. When sneezing or coughing, a handkerchief should be held over the mouth. Kissing of children is also a dangerous practice and should be avoided.

Procedure to be Followed in Each Case. 1. Isolation of patient: Complete isolation of the patient must be maintained until terminated by order of the Department of Health.

2. A separate room must be provided for the patient. No one must be allowed in this room except the attending physician, the nurse, and the representative of the Department of Health.

3. Care of patient's room and surroundings: (*a*) All rugs, carpets, draperies, and unnecessary furniture must be removed before the patient is placed in the room.

(*b*) All windows must be screened.

(*c*) The sick room must be kept well aired at all times.

(*d*) The woodwork must be wiped daily with damp cloths. Under no circumstances must the floor be swept when it is dry. It should be sprinkled with sawdust, bits of newspaper or tea leaves, all thoroughly moistened and then carefully swept so that no dust may arise.

(*e*) Toys and books used by the patient must be destroyed by burning after recovery or death.

(*f*) Household pets must not be allowed in the room.

4. Care of bedding: All cloths, bed-linen, and personal clothing which have come into contact in any way with the patient must immediately be immersed in a 5 per cent. solution of carbolic acid and allowed to soak for three hours. They may then be removed from the room and must be boiled in water or soapsuds for fifteen minutes.

5. Care of discharges from body: A sufficient supply of gauze or clean linen or cotton cloth must be provided and all discharges from the nose and mouth of the patient received on these cloths. After use they must be immediately burned or boiled. Bowel discharges and urine must be covered at once with chloride of lime and then disposed of by emptying into a water closet.

6. Care of utensils used by patient: Plates, cups, glasses, knives, forks, spoons and other utensils used by the patient must be kept for exclusive use and under no circumstances removed from the room or mixed with similar utensils used by others. They must be washed in the room in hot soapsuds and then rinsed in boiling water. After use the soapsuds and water must be thrown into the water-closet.

7. Nurse: A trained nurse or competent attendant must be in sole attendance upon the patient. She must not be allowed to mingle with the rest of the family but must be isolated with the patient. The hands of the nurse must be carefully washed in hot soapsuds after each contact with the patient and before eating.

8. Termination of case: After the case has been ordered terminated by the Department of Health the following procedure must be followed:

(*a*) The entire body of the patient must be bathed and the hair washed with hot soapsuds. The patient should then be dressed in clean clothes (which have not been in the sick room during the illness) and removed from the room.

(*b*) The nurse should also take a bath, wash her hair, and put on clean clothes before mingling with the family or other people.

Action Taken by the Department of Health in Each Case. Placarding: Every house will be placarded without exception. In private houses one placard is placed on the street front (outside of house), and one placard is placed on the door entering the room patient is in. In tenements three placards are affixed, one on street door, one in entrance hall, and one on door of apartment. All placards are dated.

Quarantine: In all families where a case of poliomyelitis has occurred all other children under sixteen years except those who have had the disease are to be quarantined in the home until two weeks after the termination of the case by death, removal, or recovery.

The patient, whether at home or in hospital, must be quarantined for eight weeks from onset of disease.

Children under sixteen years of age who have been, but no longer are, exposed to infection will be quarantined for fourteen days.

Removal to hospital: No case is to be left at home unless the following conditions are complied with:

(*a*) There must be a private physician in attendance regularly.

(*b*) Persons attending patient must obey quarantine rules; must not do any housework, marketing, or leave premises.

(*c*) Patient and attendant must have separate rooms.

(*d*) All windows of rooms used by patient must be screened.

(*e*) The family must have a separate toilet for its exclusive use.

(*f*) Quarantine regulations must be strictly observed by patient and other children.

Deaths: In case of death prompt burial is required, the coffin must be sealed as in deaths from other contagious diseases, and the funeral must be strictly private. Church funerals are prohibited.

Spinal puncture: Physicians desiring the services of a consultant to perform lumbar puncture and report on the examination of spinal fluid should telephone to the Department of Health."

Once the diagnosis is accepted by family and physician, the next step is fairly clear. Contact is effectively prevented in hospitals and less consistently in the home even when there is unusually intelligent and favorable care. Removal of the sick child to a hospital, if accepted by parents, is a simple matter; if opposed, it may prove the irritant which sets a whole community against the simplest and gentlest measures of restraint. Anything which causes antagonism of the public to the policy of reporting and removal to isolation hospitals, develops deception, hiding of cases, and such methods of obstruction as to frustrate to a great degree any approach to successful separation of the sick from the well. Once the case is under surveillance at home or in hospital the uncertainty as to a reasonable period of isolation becomes prominent. The parents and the press ask embarrassing questions. What is the duration of infectiousness? If six weeks is not certain is six months any more so? Why eight weeks in New York City and six weeks elsewhere throughout the country? Six weeks has been generally agreed to as a suitable isolation period dating from the day of onset, the only adequate basis for this being that, after six weeks, infectious material has rarely been obtained from artificially infected monkeys. We established the isolation period at eight weeks in New York City at the beginning of the epidemic, to impress the public with the seriousness of the danger and partly to obtain a greater percentage of voluntary hospital admissions. There is no reason to believe that eight weeks' isolation of infected individuals is of any more value than the more commonly accepted six weeks' period.

How long the incubation period? Is a child recovered from paralysis still infectious? How long before the disease expresses itself has a patient been infectious? Only provisional answers can be offered to any of these questions.

Whether or not hospitalization justifies itself as a sanitary measure to protect susceptibles against exposure to infected individuals, it has resulted in definite and marked improvement over the usual treatment given to the children of the poor in their homes during the acute stage of the disease and in the prevention of much avoidable subsequent deformity.

There are too many undetermined factors which may have played a part, to draw positive conclusions as to the effect of hospitalization upon the distribution of poliomyelitis in New York, but it is certainly suggestive that in the Borough of Manhattan where more than 90 per cent. of all reported cases were removed to hospitals, the case incidence of the disease was 0.94 per 1000, while in Brooklyn, where not over 50 per cent. of the cases were taken from their homes for isolation purposes, the case incidence was 2.24 per 1000 of the population.

The unusual opportunity offered by the assembling of such a number of acute cases and holding them for a long isolation period should not be lost to the medical profession. Postgraduate clinical teaching should be carried on as systematically as the emergency conditions prevailing will permit.

More than 800 physicians visited the wards of the Willard Parker Hospital, where, for a considerable period we had under observation 2078 cases of the disease. During the epidemic we had a total of 5437 cases under treatment in the hospitals of the Department of Health.

Health officers owe it to the practitioner of medicine to see that every facility is given to study and observe all clinical phases of the disease, and to inform himself as to the possibilities of early and accurate diagnosis and promising or unprofitable methods of treatment.

It is impracticable to allow each patient to be treated by the family physician, and it is undesirable to allow more than the minimum of visits by family or friends. Two visits by members of the family in eight weeks was our rule, and in this way we avoided the development and spread among the patients of the other communicable diseases of children. Complete exclusion of the family would prevent public support of the policy of hospitalization.

Morphological, cultural, and biological tests for the presence of the infecting organism are not yet sufficiently precise or uniform to offer any service to the public health officer. The detection of carriers or of the infectious preparalytic or non-paralytic cases is thus impracticable.

As to general measures of personal restraint directed to the abatement or prevention of an epidemic we are even more at sea than in the field of individual quarantine. As a means of impressing upon the public the seriousness of the epidemic and the need of caution, various measures may be justified, among them the ban upon public assemblages of children within confined spaces, except where medical or nursing supervision and identification of homes or addresses of children could be maintained.

Identification of travelers, especially of children, and their supervision at their place of arrival for the presumed incubation period of the disease is another reasonable means of controlling obvious transmission of the disease; but the incompleteness of this under modern conditions of traffic and in view of the probability of the presence of large numbers of healthy carriers, children and adults, makes its advisability very questionable.

The alternative, one may say, is the absolute quarantine against people coming from places where the disease is prevalent. I hardly need to recall the countless instances of inconvenience, hardship, yes real brutal inhumanity which resulted from the application of the general quarantine of counties, towns, and States against each other during the past summer. I do not know of any health officer who can or has maintained that such measures have had the slightest effect upon the incidence or spread of the disease in his jurisdiction, and I know that nothing has developed so many automobile detours, such ingenuity in the violation of the laws, and such whole-hearted disrespect for reasonable sanitary law and its enforcement.

General reporting by the health officer at the point of departure to the health officer at the place of destination of travelers under the age of sixteen years would probably accomplish all that can be expected. Modern methods of sanitary control are directed toward localizing the disease in the person of the sick individual. Interference with the traveling of healthy people cannot be legally justified, nor will it be cordially supported by the public until health officers can make good their ability to detect and prove the presence of the virus in any one other than those actually suffering or recently recovered from the disease, and in a way that will not materially hinder personal freedom.

In the case of diphtheria, typhoid, cholera, cerebrospinal meningitis, tuberculosis, and malaria carriers we can with but insignificant inconvenience to the individual protect the public by the use of simple and accurate methods of diagnosis. Furthermore, the rapidity and irregularity of the spread of the disease to other communities develops amazing and laughable inconsistencies in any efforts at local quarantines, as, for example, was the case of quarantines enforced by various communities in New Jersey, Connecticut, and Long Island when the communities outside the city showed a case incidence in some instances from two to four times as high as that of New York City itself.

If it is admitted that consistent and scientific control of communicable diseases is properly directed to preventing the escape of infectious material from the immediate person or vicinity of the infected individual, and if we can believe the records which indicate that epidemics of poliomyelitis do not occur in schools and institutions as they do commonly in the case of other communicable diseases of childhood, then interference with attendance of children at school is hardly excusable except as a concession to the apprehension of parents. This applies with still greater force to the application of prohibitory regulations to institutions of learning for students of sixteen years or over. The experience in New York City in the public schools and in the City College and other colleges and trade schools fully supports this view.

It is to be deplored that many private schools and colleges adopted regulations calculated to protect their patrons, though with the reasons for their measures based more upon the fears of the parents than upon any probable protective results. The managers of schools and colleges, depending for their income and the support of benefactors upon the good-will of present or prospective students and their parents, may find it good policy to take extraordinary precautions to prevent the invasion of poliomyelitis with the assembling of students for the fall term. One of the results of such additional restrictions has been the development of a feeling often expressed that the children of the poor were but doubtfully protected by the public officers, while the rich received the benefit of a wiser and more conservative policy. Nothing in our experience with the 900,000 public school and parochial school children in New York City gives any support to this point of view.

Uniformity of action among school and college principals in September would have gone far to allay public alarm instead of permitting additional confusion in the public mind and inconveniencing to no good purpose many thousands of families.

Unless there are demonstrable results to be expected from the application of more drastic regulations, those adopted by qualified public health authorities should be accepted and followed by private governing bodies of schools, and colleges, with the approval and advice of their own medical consultants.

Just as interstate uniformity of procedure is advisable under Federal supervision, so intrastate regulations in the several towns, etc., should be as nearly identical as possible.

While awaiting the receipt of the essential information which will justify a logical and efficient administrative control of epidemic poliomyelitis, the health officer of any community can hardly do better than plan his campaign in matters of regulation and public education in accordance with the declaration of the American Public Health Association, which I take the liberty of quoting in full:

> "The specific cause of poliomyelitis is a microörganism, a so-called virus, which may be positively identified at present only by its production of poliomyelitis in monkeys experimentally inoculated. Such experiments have shown this virus to be present not only in the nervous tissues and certain other organs of persons who have died of poliomyelitis, but also in the nose, mouth, and bowel discharges of patients suffering from the disease. It has been proved by similar experiments that healthy associates of poliomyelitis cases may harbor the virus in their noses and throats.
>
> These experiments, together with the fact that monkeys have been infected by direct application of the virus to the mucous membrane of the nose and by feeding of the virus, are strong evidence that in nature infection may be directly spread from person to person.
>
> Observations on the occurrence of the disease might seem at first thought to be inconsistent with this conception, since contact between recognized cases can seldom be traced. However, this may be adequately explained by the lack of means for detecting mild non-paralytic cases, and by the belief that healthy carriers of the virus and undetected cases are considerably more numerous than frankly paralyzed cases.
>
> Many facts, such as the seasonal incidence and rural prevalence of the disease, have seemed to indicate that some insect or animal host, as yet unrecognized, may be a necessary factor in the spread of poliomyelitis, but specific evidence to this effect is lacking, and the weight of present opinion inclines to the view that poliomyelitis is exclusively a human disease and is spread by personal contact, whatever other causes may be found to contribute to its spread. In personal contact we mean to include all the usual opportunities, direct or indirect, immediate or intermediate, for the transference of body discharges from person to person, having in mind as a possibility that the infection may occur through contaminated food.
>
> The incubation period has not been definitely established in human beings. The information at hand indicates that it is less than two weeks, and probably in the great majority of cases, between three and eight days.
>
> If the foregoing conception of the disease is correct, it is obvious that effective preventive measures approaching complete control are impracticable, because isolation of recognized cases of the disease and restraint upon their immediate associates must fail to prevent the spread of infection by unrecognized cases and carriers.

These difficulties would appear to be inherent in the nature of the disease. Nevertheless, we may hope for the development of more thorough knowledge which will permit of more effective control of the disease than is now practicable. Of first importance is the more general recognition by practitioners of non-paralytic cases through clinical observation and laboratory procedures.

Lumbar puncture has been shown to offer valuable aid in diagnosis and a more general use of this test is to be encouraged, since it not only facilitates accurate and early diagnosis, but in many cases affords symptomatic relief as a therapeutic procedure. Without undertaking to predict the future progress of research, we may hope for certain possible developments which may afford far more effective control of the disease, with substantial relief from many inconveniences at present inevitable. Among these possibilities we would include: a practical test for the detection of all clinical types and carriers; a simple and reliable test for distinguishing between susceptible and insusceptible persons; and means of conferring artificial immunity against poliomyelitis.

At present our information demands the employment of the following administrative procedures in attempting to control the disease:

1. The requirement that all recognized and suspected cases be promptly reported.
2. Isolation of patients in screened premises. The duration of infectivity being unknown the period of isolation must necessarily be arbitrary. Six weeks has been recommended by the Conference of State and Territorial Health Officers with the Surgeon-General of the Public Health Service as sufficient, and this period has been generally accepted throughout the United States.
3. Disinfection of all body discharges.
4. Restriction of the movements of intimate associates of the patient so far as practicable. This should include at least exclusion of the children of the family from schools and other gatherings.
5. Protection of children so far as possible from contact with other children or with the general public during epidemics.
6. Observation of contacts for two weeks after the last exposure.

There is no specific treatment of established value in poliomyelitis. During the persistence of the acute symptoms of the disease the important principles of treatment are rest in bed, symptomatic relief, and passive support for the prevention of deformities. Active measures during this stage are not only useless but are apt to cause serious and often permanent injury. Hospitalization of patients when possible is to be encouraged. The best chances of recovery from residual paralysis demand skilful after-care, often long continued, and always under the direction of a physician familiar with the neurological and orthopedic principles of treatment. The provision of such after-care often becomes a community problem, demanding the coöperation of all available agencies, social and professional."

As a matter of historical interest and to present the result of the experience of the Department of Health of the City of New York, I append the following text of information for field workers which describes the procedure in the various phases of the work undertaken in the effort to check the spread of the disease last summer.

"1. GENERAL INFORMATION. *Incubation Period.* The incubation period of the disease and the quarantine period of children under sixteen years of age who have been, but no longer are, exposed to infection has been set at fourteen days.

Quarantine. In all families where a case of poliomyelitis has occurred, all the children under sixteen years (except those who have had the disease) are quarantined in the home until two weeks after the termination of the case by death, removal, or recovery. The patient, whether at home or in hospital, is quarantined for eight weeks from the date of onset of the disease. No case in hospital may return home until quarantine is ended.

Placards. All premises where a case of poliomyelitis occurs are placarded, the only exceptions being hotels and boarding houses, which are not placarded provided patient is at once removed to hospital, the room or rooms immediately disinfected, and no quarantined children remain on the premises. In private houses one placard is placed on the street wall of the house and one on the door entering room the patient occupies. In apartment and tenement houses three placards are posted—one on the street wall, one on the wall of the entrance hall, and one on the door of the apartment. All placards must be dated and initialed.

Removal to Hospital. No case may be left at home unless the following conditions are complied with:

(*a*) There must be a physician in daily attendance.

(*b*) The patient must have a special attendant who must obey quarantine regulations and must not do any housework, marketing or perform any household duties for other members of the family. He or she can, however, leave the house provided the necessary precautions as to personal disinfection, etc., are observed, but should avoid all children.

(*c*) The patient and the attendant must have a room, or rooms, separate from the rooms of others in the family.

(*d*) All the windows of this room must be screened and all flies in the room killed.

(*e*) The family must have a separate toilet for its exclusive use.

(*f*) Quarantine regulations must be strictly observed by the patient and the other children of the family, if any. When the disease occurs in the premises of families of food handlers the employment of such person or persons at this occupation is forbidden, unless they occupy entirely separate apartments for a period of two weeks after the removal, recovery, or death of the patient.

(*g*) Disinfection and renovation: The personal and bed-linen of the patient must be properly disinfected and, after removal, recovery or death of the patient, complete renovation of the room or rooms occupied by the patient and attendant is required.

2. DUTIES OF INSPECTORS. Cases are reported by physicians, nurses, social workers, and other citizens, and all are visited at once by inspectors, even those reported by physicians, with request that they be admitted to hospital. Attending physicians to Department Hospitals may admit cases direct, without inspector's visits.

The janitor or his representative must be seen in every instance and notified that he or she will be held personally responsible by the Department for keeping quarantined children in the family premises and seeing that placards are not removed or defaced.

If the inspector makes or confirms the diagnosis of poliomyelitis, the Borough Office of the Department is notified and by it the ambulance is summoned, if removal is indicated. In every case the inspector leaves the hospital admission slip, properly and fully filled out. When case is left at home, inspector must give full instructions to family.

All cases of questionable diagnosis must be seen at once in consultation with the Borough or Chief Diagnostician, and whenever it is required, spinal puncture will be made and laboratory report submitted by the staff of the Research Laboratory. Cases with positive laboratory findings will be considered as poliomyelitis, regardless of clinical signs. A full history must be recorded on a special card for each assignment covered by inspectors.

3. DUTIES OF NURSES. Nurses will visit every case reported, to instruct the family regarding quarantine, and every other family in the house:

(*a*) That there is a case of this disease in the house.

(*b*) That the other children of the family in which the disease has occurred will be quarantined, and that should they fail to observe quarantine, that fact should be immediately reported to the Department of Health, when steps will be taken to enforce quarantine by a summons to Court.

(*c*) Regarding home cleanliness, personal hygiene, the danger of infection by flies, and other general measures which should be taken to prevent infection.

(*d*) To report at once to the Department any cases of suspicious illness of children, or any case of poliomyelitis, especially if there is no physician in attendance.

A current history must be kept by the nurse for every case, giving dates of visits, action taken, and date and mode of termination.

Nurses must see the janitor or his representative on first visit, and repeat the instructions given by the inspector.

Patients remaining at home and families with quarantined children are visited daily by the nurse or patrolman for the maintenance of quarantine, and oftener if necessary. After removal, recovery or death of the patient, nurses issue renovation notices, following these up by visits until complied with.

4. DUTIES OF SANITARY POLICE. These officers visit frequently—daily if necessary—quarantined premises, to enforce quarantine of patient and other children in the family, and to affix or replace placards. They serve summonses when quarantine regulations are violated and appear in Court.

5. AMBULANCE SURGEONS. All cases ordered removed to hospital must be removed by the ambulance surgeon without question, with the following exceptions, in each of which the ambulance surgeon must first obtain telephone authorization from the Resident Physician of his hospital to leave the case at home:

(*a*) When removal would endanger life of child (bulbar cases).

(*b*) When family physician can show that requirements will be met at once (or within twelve hours).

Doubtful and mixed infection cases must be removed by themselves in a separate ambulance.

In every case ambulance surgeons must leave a card with parents, giving name and address of hospital to which patient is taken. If inspector has not left admission slip, surgeon must make out same.

6. VISITORS TO HOSPITALS. Each case may be visited twice during its stay in the hospital by a parent or guardian. If child is critically ill the guardian or parent will be notified and will be permitted to visit daily while child is dangerously ill. Information relative to condition is given out at the Information Desk in each hospital, or by telephone in response to telephone inquiry from the parent or guardian.

7. CERTIFICATES FOR CHILDREN LEAVING THE CITY. The Department of Health of New York City does not require certificates of anyone leaving or entering the city. It issues certificates only as a convenience and aid to persons leaving the city. None are issued to persons passing through the city.

Such certificates state that the persons or family therein named have not resided in a house where a case of poliomyelitis has occurred. The applicant must sign a request for the certificate. They are refused to persons who live in a house where a case of infantile paralysis has occurred or who present symptoms of the said disease.

The certificates are good only until midnight of the following day, except when issued on a Saturaday or on the day preceding a holiday, when they are good until midnight of the second following day.

Persons Leaving New York State. Officers of the U. S. Public Health Service, stationed at transportation terminals, require the above certificates before they will permit children under fifteen years of age, resident in New York City, traveling to points outside the State of New York, to leave the city. The original applicant must again sign the certificate in the presence of the Federal Health Officer. Federal Health Officers do not require certificates of any adults.

Persons Going to Points within New York State. Residents of New York City, adults or children, traveling to points within New York State, who present certificates of good health from their family physicians, may also obtain the above certificates from the Department of Health. If no physician's certificate of good health is presented, applicants will be examined by a physician and their freedom from symptoms of poliomyelitis certified; in this case all children must be brought to the proper office of the Department.

8. RETURN OF CASES OF POLIOMYELITIS TO NEW YORK CITY. Cases of poliomyelitis occurring in residents of New York City who are temporarily residing outside the city, and developing within two weeks of the time of leaving the city, will be permitted to return, provided (*a*) a private conveyance (private car, private automobile, carriage or ambulance) is used, and (*b*) the patient goes direct to a hospital authorized by the Department of Health to care for cases of poliomyelitis.

Cases in which the onset of the disease occurs two weeks or more after leaving the city, may not return to New York City until eight weeks from the date of onset of the disease. But in special cases, where proper medical, surgical and nursing care is not obtainable, patients may be brought back to the city in a private conveyance, providing they go directly to a private room in a private hospital authorized by the Department of Health to receive cases of poliomyelitis.

9. RETURN OF CHILDREN WHO HAVE BEEN EXPOSED TO POLIOMYELITIS TO NEW YORK CITY. Children under sixteen outside of New York City who have been exposed to infection with poliomyelitis within two weeks, may return to the city under the following conditions:

They must come by private conveyance and must go direct to their homes.

Advance notice must be sent, and authorization obtained, by telephone, by the local Health Officer. Such notice must give the name and age of each child, together with the identified address, including the floor, and the latest date of exposure to infection, and must be followed immediately by a written notice.

Such children will be promptly visited at their homes by a representative of the Department of Health, and instructed as to nature and duration of quarantine. They must not leave the premises until two weeks have elapsed from the date of last exposure to infection.

The premises are not placarded, but the children are visited at regular intervals, and should quarantine be violated the parents or guardians are summoned to Court and fined."

POLIOMYELITIS: THE PREPARALYTIC STAGE AND DIAGNOSIS.

By John Ruhräh, M.D.,
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To anyone who has passed through one or more epidemics of poliomyelitis, or who has become thoroughly conversant with the disease through reading, the following pages will be of only passing interest; but I am convinced from my association with other physicians, particularly in seeing cases of the disease, that an article dealing with the preparalytic stage, with the findings in the cerebrospinal fluid, and a few points on the differential diagnosis will be welcomed by many. The old idea of the disease and its clinical paralytic form has become fixed in the minds of the medical profession, so that it will need repeated contributions to eradicate these earlier conceptions of it. I have had, during the past six months, a rather unusual opportunity of seeing a large number of cases, and it was with pleasure that I responded to the invitation of the editor to prepare the following pages.

The Abortive Form and Preparalytic Stage. Wickman, in his marvelous monograph, divides the abortive cases into four classes:

1. Those with the course of a general infection.
2. Those showing meningeal irritation.
3. Those with marked pains suggesting an influenza.
4. Those with accompanying gastro-intestinal disturbances.

To this one might add a fifth, for the purpose of calling attention to it, of an anginal form, or those beginning with definite sore throat.

It should be borne in mind that poliomyelitis is a disease which, probably in a very large proportion of cases, does not involve the nervous system to such an extent as to cause special symptoms, and the cases characterized as abortive are merely those which go through a preparalytic stage without having any definite paralysis following. If this point is borne in mind it simplifies the conception